Landlok®
Earthstopping Solutions.™

Erosion Control Mats

Engineered slope vegetation and improved storm water quality

PROPEX® FABRICS

4DS®

Applications

Sediments containing hydrocarbons, suspended solids and metals account for more than two-thirds of all pollutants entering U.S. waterways. Controlling soil erosion and sediment-laden runoff are critical parts of every storm water management program.

According to the EPA's Storm Water Technology Fact Sheets, vegetation is the most sensible form of erosion control available. It not only holds soil in place, but also, through photosynthesis, contributes to the removal of harmful contaminants.

Propex, in a strategic partnership with Advanced Drainage Systems, offers a complete selection of both Landlok® degradable and long-term non-degradable erosion control products designed to handle many storm water, drainage or erosion prevention applications.

These products can be used to establish vegetation and prevent soil erosion on slopes, storm water channels, stream banks, shorelines, and even around pipe inlets/outlets.

On slopes, Landlok erosion control products protect newly seeded soil from raindrop impact and accelerate seedling development. The system minimizes soil loss and promotes infiltration, assuring that seed and soil are not washed away. Landlok slope protection products are much more effective than hydraulic mulch and blown straw, and much more economical than concrete slope paving or rock riprap.

In channels, Landlok erosion control products not only protect soils and seed, but also help capture sediment and other contaminants from passing storm water. Permanent, non-degradable Landlok turf reinforcement mats enhance vegetation performance tremendously, resisting erosion and tearing of the vegetation even under excessive water velocities.

Slopes

Deployment of Landlok TRM on a steep slope adjacent to Hawaii DOT H-3 project.

ECBs provide effective erosion control on shallow to moderate slopes.

Channels

This low-flow channel benefits from the installation of Landlok 407 GR. Seed is stabilized to allow for full, rapid growth.

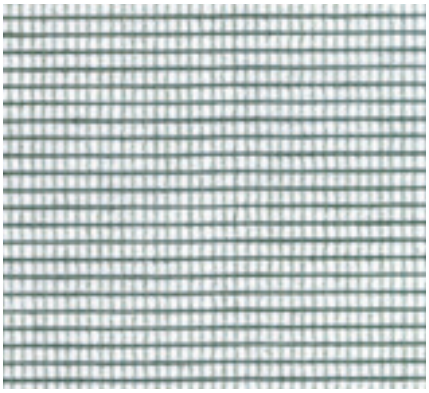
As the ECB degrades, vegetation prevents sediment runoff. The channel now blends nicely with its environment.

Installation of Pyramat high performance turf reinforcement mat (HPTRM) on this drainage channel in Mesquite, Nevada was specified because of the product's superior UV resistance, high tensile strength, and overall durability.

Erosion Control Blankets (ECBs)

These degradable blankets hold seed and soil in place, decomposing over time as vegetation becomes established. Available in a variety of compositions including straw, coconut and polypropylene, ECBs protect the soil and seed to accelerate vegetative development. After the ECBs degrade, vegetation alone provides the long-term erosion protection.

• Landlok 407 GR



Natural-looking, photodegradable high-strength polypropylene mesh designed for low-flow channels and moderate slopes. Life span is up to one year.

• Landlok S1

Pure wheat straw fibers stitch-bonded to a single photodegradable polypropylene netting on the top side only. Intended for low-flow channels and moderate slopes, with a less than one-year life span.

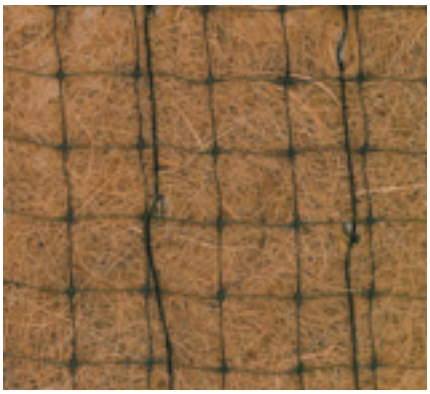
• Landlok S2

Composed of 100% wheat straw fibers stitch-bonded to two photodegradable polypropylene nets on the top and bottom sides. Ideal for low-flow channels and moderate slopes. Life span is one year.

• Landlok CS2

A blend of wheat straw and slower degrading coconut fibers mechanically bonded to two photodegradable polypropylene nets on the top and bottom sides. Made for medium runoff conditions, and for sites where longer-term vegetation protection is needed. Life span is approximately two years.

• Landlok C2



Slow degrading coconut fibers stitched to two photodegradable polypropylene nets on the top and bottom sides. Designed for moderate flow velocities and steeper slopes where vegetative establishment may take up to three years.

• EN Series

Landlok ECBs with EcoNets™ (EN) are designed for environmentally sensitive areas with light to moderate water runoff conditions. Their unique leno-weave jute biodegradable netting, in combination with straw, coconut fiber or a blend of the two organic materials, makes these blankets ideal for a variety of environmental restoration and sensitive applications.

• RD Series

Rapidly degrading (RD) blankets are designed for applications where vegetation may be established quickly, followed by maintenance activities such as mowing. Special additives accelerate the photodegradation of the nettings to reduce the likelihood of entanglement with mowing equipment. Typical applications include roadsides, parks and golf courses.

Turf Reinforcement Mats (TRMs)

TRMs are permanent and non-degradable, providing vegetation with twice its normal erosion protection. Composed solely of synthetic materials, TRMs provide immediate erosion protection, rapid vegetative establishment, and outstanding long-term erosion protection by reinforcing the vegetation. TRMs have become the preferred alternative to hard armor (concrete and riprap) in the protection of open channels, drainage ditches, detention basins, and steepened slopes.

• Landlok TRM 450

Comprised of a dense, three-dimensional web of green polyolefin fibers mechanically bonded between two nets. This matrix has been designed not to be soil-filled in order to provide maximum erosion protection through increased ground coverage, while providing immediate aesthetics and growth of vegetation through the mat. TRM 450 is generally placed above a seeded surface and relies upon sediment capture rather than soil filling for increased stability.

• Landlok TRM 435

Essentially similar to TRM 450, the TRM 435 is a more economical mat designed for lighter duty applications.

• Landlok TRM 1060

Consists of a lofty, three-dimensional web of green or tan polyolefin fibers positioned between two high-strength, biaxially oriented nets mechanically bound together by polyolefin stitching to form a dimensionally stable matrix. It has sufficient thickness and void space, balanced with optimal ground cover, to allow soil filling and/or retention as well as emergence of plants from beneath or within the matrix.

• Landlok TRM 1051

This is a modified version of the tan TRM 1060, created mainly for shorelines and similar installations where the vegetation is subject to wave action and fluctuating water levels. The 1051 features a nonwoven geotextile stitched to the back to prevent potential soil loss.

• Pyramat® High-Performance TRM

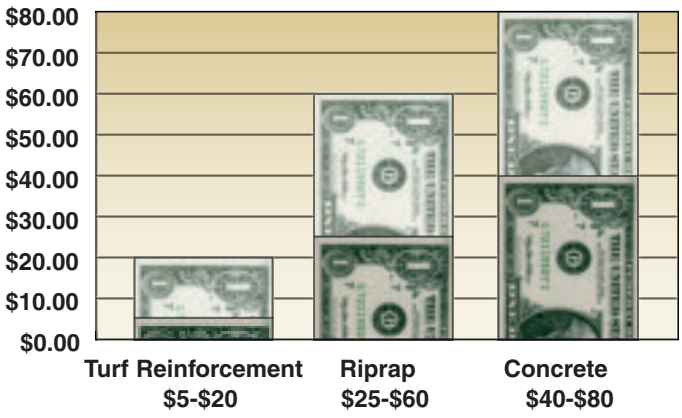
Ten times stronger than traditional TRMs, Pyramat is designed for the most demanding slope and storm water channel applications. It is a three-dimensional lofty matrix consisting of tan or green polypropylene yarns woven into a uniform configuration of resilient pyramid-like projections. It exhibits strong interlock capabilities with both soil and root systems, with a very high tensile modulus. This is important in arid or semi-arid environments where partial vegetation is all that can be obtained. Pyramat meets the EPA and FHWA definitions of a high performance TRM.

New X3™ Fiber Technology

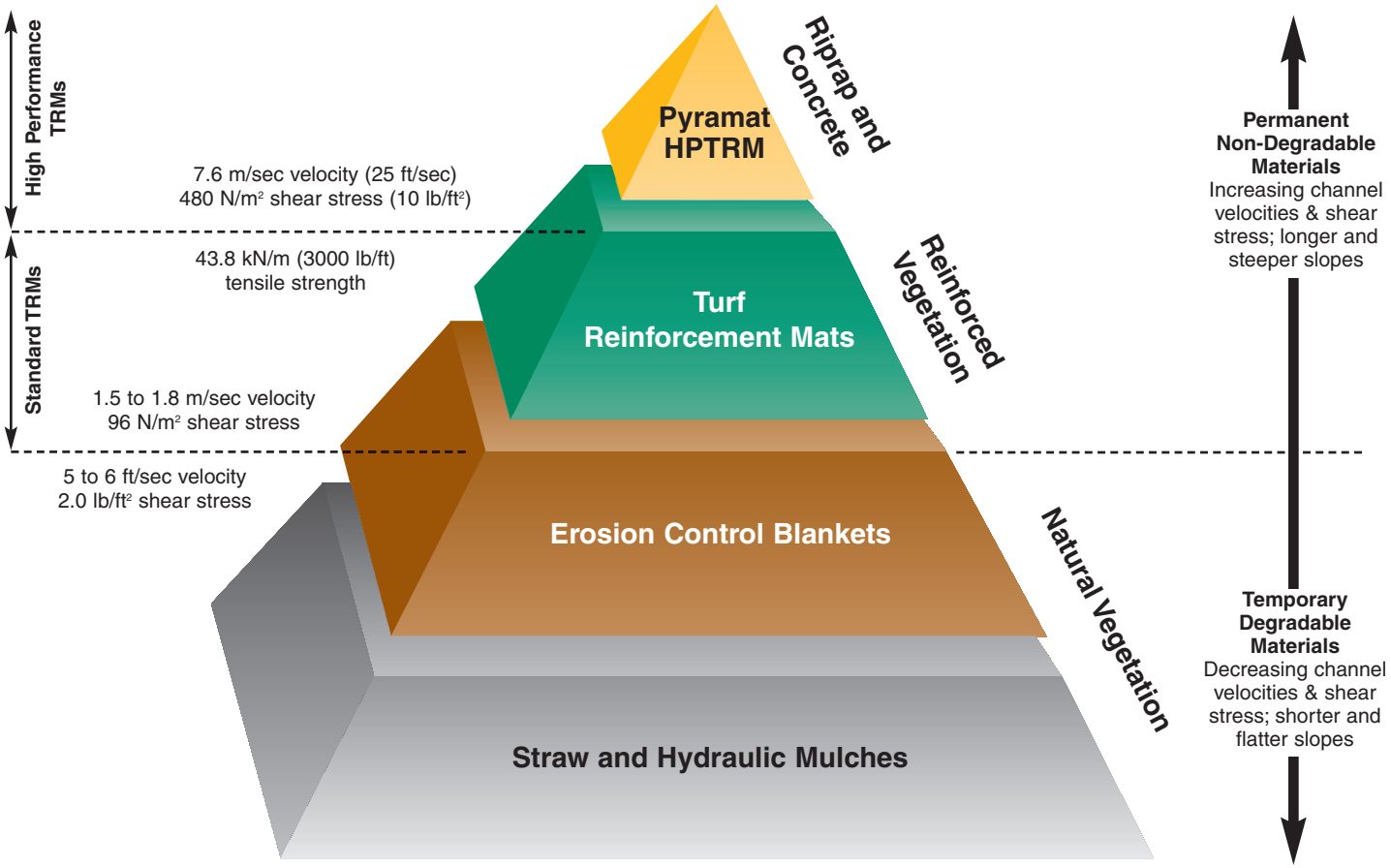
This revolutionary fiber production process enhances seedling emergence and development rates compared to traditional fibers used in conventional stitch-bonded turf reinforcement mats. The X3 extrusion technology creates unique, multi-faceted fibers that provide over 40% more surface area than conventional round or oval monofilament fibers. These new fibers are oriented into a semi-triangular pattern that creates a thick matrix of voids for trapping and holding more of the water, sediment and seed required for rapid vegetation growth. The benefits of X3 technology are significant: a 40% increase in seedling emergence, a 10% increase in resiliency, and a 60% increase in tensile strength.

Installed Cost Per Square Yard

Turf Reinforcement Mats, in addition to their superior pollutant removal capability and aesthetics, are also far less costly to install than traditional hard armor systems. The chart at right illustrates the significant installed cost savings of TRMs, an important factor to consider, particularly when project budgets are tight.



Measurable Benefits



Benefits

- Qualify as an EPA Phase II Best Management Practice, serving as part of an overall storm water management plan.
- Prevent sediment runoff
- Promote ground water recharge
- Reduce peak flows and runoff velocities
- Easy inspection and maintenance
- Safer and less costly than hard armor solutions

Removal of Pollutants

EPA-sponsored studies have shown that grassed swales and vegetated slopes are extremely effective in removing particulate pollutants. Conservative estimates are 25 to 50% pollutant removal efficiencies, but values ranging from 70 to 95% have been achieved on most sites.

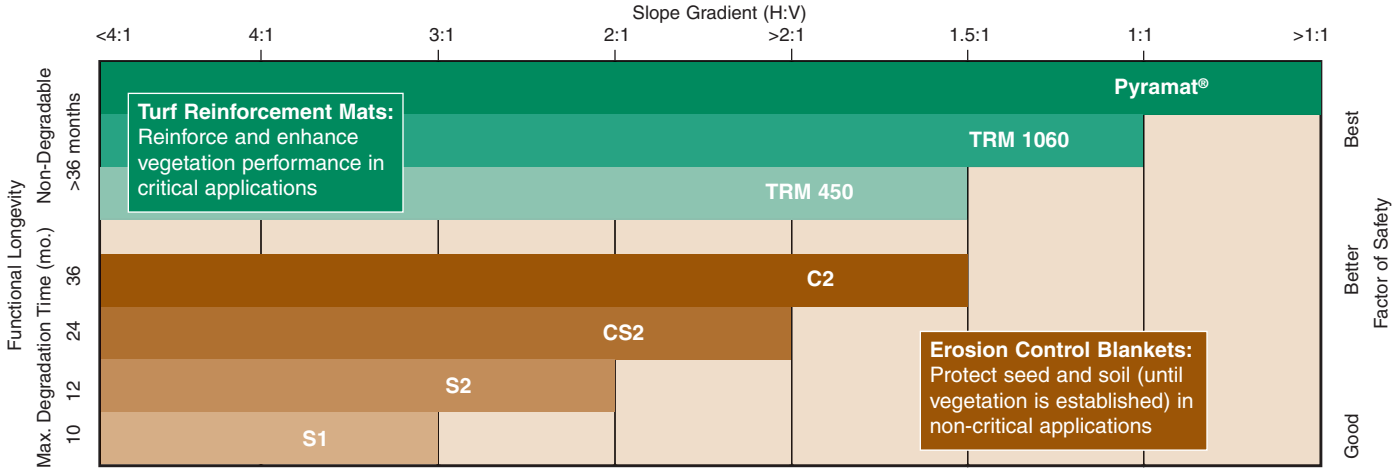
EFFECTIVENESS OF DESIGN SWALES

Pollutant	Median Percent Removal
Total Suspended Solids	81%
Oxygen Demanding Substances	67%
Nitrate	38%
Total Phosphorous	9%
Hydrocarbons	62%
Cadmium	42%
Copper	51%
Lead	67%
Zinc	71%

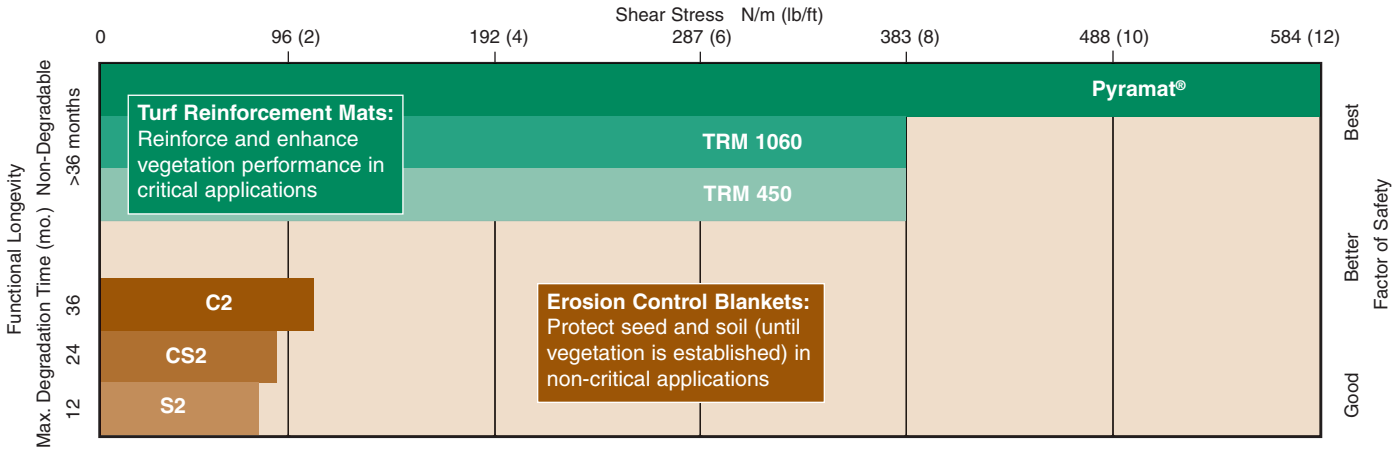
Source: "Storm Water Technology Fact Sheet – Vegetated Swales", Doc. No. 832-F-9-006, U.S. EPA Office of Water, September 1999

Product Selection

Soil Slope Protection [1, 2, 3, 6]



Channel Lining Systems [1, 4, 5, 6]



NOTES:

1. For use in initial selection of Landlok erosion control materials only. Final selection of an appropriate product should be done by an experienced designer familiar with slope stability or channel design and lining material selection. Site-specific parameters such as climate, soil, geometry, vegetation selection and irrigation installation conditions should be considered.
2. Slope length is also an important factor in the selection of erosion control materials. For more information, refer to our EC-DESIGN® software package or consult an ADS technical representative.
3. For more severe conditions where a long-term non-degradable material is desired, Landlok turf reinforcement mats should be selected. This selection chart is only applicable if soil slope is stable and all upland surface water flow is not concentrated down slope.
4. Vegetation is a critical component in a channel lining system. For more information on vegetation classes, consult the Federal Highway Administration's (FHWA) Hydraulic Engineering Circular -15 (FHWA HEC-15) classification of vegetative covers, or a local authority on appropriate species selection.
5. Degradable Landlok erosion control blankets should only be used in applications where the maximum shear stress is less than the permissible shear stress of the vegetation alone (i.e., < 2 lbs/ft^2 or 5 ft/sec). The listed maximum permissible shear stress for vegetation is from FHWA's "Design of Roadside Channels with Flexible Linings" (HEC-15), Table 2.
6. For an increased factor of safety, choose a material with higher functional longevity and tensile strength characteristics. For more information, see "Storm Water Technology Fact Sheet: Turf Reinforcement Mats," EPA 832-F-99-002, September 1999.

Product Specifications

Erosion Control Blanket Specifications

Property	Test Method	Units	S1[1]	S1RD[1]	S2[1]	S2RD[1]	CS2[1]	C2[1]	ENS2[1]	ENCS2[1]	ENC2[1]
Thickness	ASTM D-1777[2]	mm in	2.8 0.11	2.8 0.11	6 0.25	6 0.25	10 0.40	8 0.30	9 0.35	8 0.30	11 0.30
Tensile Strength	ASTM D-5035	kN/m lb/ft	0.7 x 0.9 50 x 65	0.7 x 0.9 50 x 65	1 x 1 75 x 75	1 x 1 75 x 75	1.5 x 1.5 100 x 100	2 x 2 150 x 150	3 x 2 190 x 130	3 x 3 190 x 190	3 x 3 190 x 190
Elongation	ASTM D-5035	%	20	20	25	25	30	25	7	7	7
Mass per Unit Area	ASTM D-5261	g/m² oz/yd²	288 8.5	288 8.5	298 8.8	298 8.8	294 8.7	356 10.5	298 8.8	360 10.6	390 11.5
Functional Longevity	Observed	months	up to 10	up to 6	up to 12	up to 6	up to 24	up to 36	up to 10	up to 18	up to 24

NOTES:

1. Standard Roll Size for these styles is 2.3 x 36.5 m (7.5 x 120 ft.) with 84 m^2 (100 yd^2) per roll.
2. Modified ASTM D-1777 using 6 inch Pressure Plate and 0.2 kPa.

Turf Reinforcement Mat Specifications

(Minimum Average Roll Values)[1]

Property	Test Method	Units	TRM 435	TRM 450	TRM 1051	TRM 1060	Pyramat
Thickness	ASTM D-1777[2]	mm in	8.9 0.35	12.7 0.50	10.1 0.41	15.2 0.60	12.7 0.50
Resiliency[3]	ASTM D-1777[2]	%	80	80	80	80	80
Porosity[4]	Calculated	%	96.5	97	95	96.6	–
Ground Cover Factor[5]	Light Projection Analysis	%	60	75	95	60	75
Tensile Strength	ASTM D-5035	kN/m lb/ft	2.1 x 1.6 145 x 110	2.4 x 1.8 170 x 130	4.3 x 3.2 300 x 225	3.2 x 2.4 220 x 165	45.2 x 29.2 3,100 x 2,000
Elongation	ASTM D-5035	%	50 (max)	50 (max)	20 (min) - 85 (max)	40 (max)	55 (max)
Mass per Unit Area	ASTM D-5261	g/m² oz/yd²	271 8.0	340 10.0	475 14.0	475 14.0	475 14.0
UV Resistance	ASTM D-4355	%	80 @ 1000 hrs	80 @ 1000 hrs	80 @ 1000 hrs	80 @ 1000 hrs	90 @ 3000 hrs
Standard Roll Size	–	m ft	2.0 x 42.2 6.5 x 138.5	2.0 x 42.2 6.5 x 138.5	2.0 x 21.1 6.5 x 69.2	2.0 x 42.2 6.5 x 138.5	2.59 x 27.4 8.5 x 90
Color	–	–	Green	Green	Tan	Green, Tan	Green, Tan

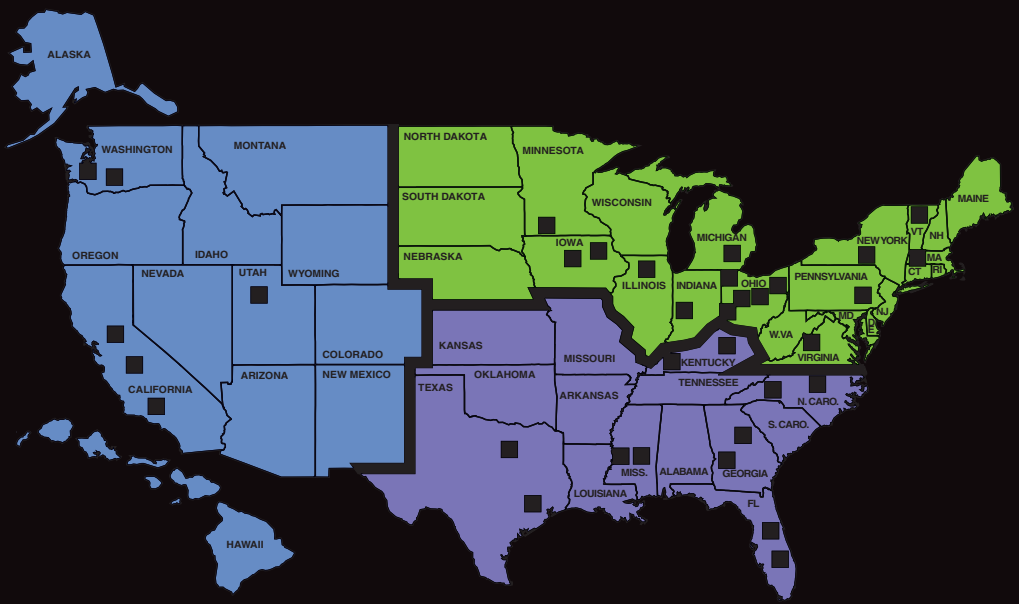
NOTES:

1. Values for machine and cross machine, respectively, under dry or saturated conditions. Minimum average roll values are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported. Typical indicates mean or average of all test data.
2. Modified ASTM D-1777 using 6" Pressure Plate and 0.2 kPa.
3. Resiliency defined as percent of original thickness retained after 3 cycles of a 100 psi load for 60 seconds followed by 60 seconds without load.
4. Porosity calculation based upon mass per unit area, thickness, and specific gravity.
5. Ground Cover Factor represents "% shade" from Lumite Light Projection Test.

Design Assistance

EC-DESIGN® is a complete erosion control design software program. Users can calculate and select the most appropriate product for a variety of channel and slope erosion control applications. The calculations follow state-of-the-practice Federal Highway Administration HEC-15 procedures, including maximum velocity and shear stress analysis, integration of compound channels, soil loss estimations, and pull-down window screens. Once the most appropriate product is selected, the results, specifications and CAD drawings are printed or can be saved on a disk. Contact your ADS representative for more information.

ADS Sales and Service Locations



To find out how ADS can meet all your geotextile needs, call 1-800-821-6710.

Zone Offices

- **MIDWEST/NORTHEAST**
  LONDON, OH
  1-800-733-9554
- **SOUTHERN**
  FRANKLIN, TN
  1-800-733-9987
- **WESTERN**
  WASHOUGAL, WA
  1-800-733-8523
- **MANUFACTURING FACILITY LOCATIONS**

PROPEX® FABRICS

ADS "Terms and Conditions of Sale" are available on the ADS website.

THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS®

ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD., HILLIARD, OH 43026
800-821-6710 *www.ads-pipe.com*

Form # 10506 05/06

Printed in U.S.A.